Original Article

Determinants of healthcare utilisation and predictors of outcome in colorectal cancer patients from Northern Iran

S. SEMNANI, MD, *Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan*, Z. NOORAFKAN, MSC, *Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan*, M. ARYAIE, MSC, *Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan*, S.-M. SEDAGHAT, MD, *Department of Health, Golestan University of Medical Sciences, Gorgan*, A. MOGHADDAMI, MSC, *Department of Health, Golestan University of Medical Sciences, Gorgan*, V. KAZEMNEJHAD, MD, *Department of Pathology, Golestan University of Medical Sciences, Gorgan*, R. KHORASANINEJHAD, MD, *Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan*, F. GHASEMI-KEBRIA, MSC, *Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan*, & G. ROSHANDEL MD, PHD, *Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan, Iran*

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We aimed to assess healthcare utilisation (HU), its determinants, as well as its relationship with survival in colorectal cancer (CRC) patients. This study was conducted on incident CRC cases from Northern Iran. Information on HU was collected using a valid questionnaire, considering eight diagnostic and four therapeutic services. The results were categorised as good and poor HU. Multivariate logistic regression analysis was used to assess the relationship between HU and other variables. Cox regression analysis was performed to determine major predictors of survival. In total, 227 new cases of CRC were enrolled. HU could be assessed in 218 subjects (96%). Living in rural areas was the strongest variable related to poor HU (adjusted OR, odds ratio = 2.65; CI, confidence interval: 1.30–5.40). The median survival time was 40.5 months. The 1-, 3- and 5-year survival rates were 71%, 52% and 44% respectively. Cox regression analysis showed a significant lower survival rate in patients with poor HU (HR = 2.3; CI: 1.46–3.64). HU was an independent predictor of survival in our CRC patients. Patients' place of residence was a significant determinant of HU. Regarding its effects on patients' outcome, HU and its determinants should be considered in designing CRC controlling programmes in our region and similar high-risk populations.

Keywords: colorectal cancer, survival, healthcare utilisation, Iran.

INTRODUCTION

Colorectal cancer (CRC) is the third most common cancer in men and the second in women worldwide (Ferlay *et al.* 2013). Different reports suggested increasing trends in incidence rate of CRC during recent decades (Boyle & Langman 2000). Genetic predisposition, alcohol intake, low physical activity, obesity, higher intakes of red and processed meat, have been suggested as risk factors for CRC, while higher intakes of dietary fibre, green leafy

*Correspondence address: Gholamreza Roshandel, Golestan Research Center of Gastroenterology and Hepatology, 10th Azar Alley, 5th Azar Street, Gorgan, Iran (e-mail: roshandel_md@yahoo.com).

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vegetables, some micronutrients such as folate, and calcium were reported to be protective factors (Kim 2009; Ferlay *et al.* 2013).

Healthcare utilisation (HU) was considered as an indicator of outcome in different conditions (Acurcio Fde *et al.* 1998). Appropriate access to healthcare services (early detection and treatment) may play a pivotal role in controlling CRC, resulting in reducing its burden in the community, especially in high-risk areas. Different factors may affect HU in patients, including pathophysiology and natural course of disease (Baser *et al.* 2012) as well as subject's socio-demographic characteristics (Roshandel *et al.* 2011; Målqvist *et al.* 2013). Assessing the status of HU, its determinants, as well as its relationship with patients' outcome may provide valuable evidences to health policy makers and may help them to develop appropriate interventions for controlling CRC.

Golestan province located in Northern Iran has been known as a high-risk area for upper gastrointestinal cancers (Mahboubi *et al.* 1973). Similar to other parts of the developing world, recent reports suggested an increase in the incidence of CRC in this region (Roshandel *et al.* 2012). The results of the Golestan Population-based Cancer Registry (GPCR) showed that CRC is the fourth and fifth most common cause of cancer in men and women from Golestan province respectively (Semnani *et al.* 2009; Roshandel *et al.* 2012). So, as in many developed and developing regions (Boyle & Langman 2000; Eser *et al.* 2010), CRC may be considered as a priority in health policy making in Golestan province of Iran.

This study was conducted to assess HU, its associated factors, as well as its relationship with CRC-specific survival in CRC patients from this region.

METHODS

This cross-sectional study was conducted on new pathologically confirmed primary CRC cases, diagnosed between 2006 and 2007 in Golestan province of Iran. Data on demographic factors and characteristics of tumour including stage were obtained from the GPCR (Roshandel *et al.* 2012). Stage of tumour was identified using instructions of summary staging system, developed by the surveillance epidemiology and end results (SEER) programme of the National Health Institute (NIH) (Young *et al.* 2001).

Data on HU were collected using a structured questionnaire. The validity and reliability of the questionnaire was approved in a previous study from our region (Roshandel *et al.* 2011). Healthcare utilisation index (HUI) was calculated using previously described methods (Roshandel *et al.* 2011). In brief, we considered eight diagnostic procedures (faecal occult blood test, abdominal X-ray, abdominal ultrasonography, CT-scan, MRI, Barium enema, colonoscopy and radionuclide imaging) and four therapeutic services (surgery, colonoscopy, chemotherapy and radiotherapy). For each service, two questions were asked including, 'if the procedure was recommended to patient' and 'if the procedure was performed for patient'. Answers 'Yes' and 'No' were scored as '1' and '0' respectively. HUI was calculated by dividing the sum of performed to the sum of recommended procedures. According to the distribution of HUI and considering the median, an HUI of 1 (i.e. all recommended services were performed for the patient) was considered as good HU and HUIs of less than 1 were considered as poor HU. Data on recommendation and performing healthcare services for patients (only those related to diagnosis or treatment of CRC) were collected through personal interview by expert interviewers. In addition, patients' hospital files as well as all other clinical and paraclinical records were also reviewed for relevant information. If the patient was dead at the time of interview, a first-degree relative was asked to provide valid information.

Using the median of age, subjects were categorised into two age groups. Multivariate logistic regression analysis was used to assess the relationship between HU and other variables. Crude and adjusted odds ratios (OR) as well as the 95% confidence intervals (CIs) were calculated. The 1-, 3- and 5-year CRC-specific survival rates were calculated. Deaths attributed to causes other than CRC were censored. Log rank test was used to compare survival rates between different groups of variables. Cox regression analysis was performed to assess the effects of different variables on patients' survival. Crude and adjusted hazard ratios as well as 95% CIs were calculated. *P*-values of less than 0.05 were considered as significant. This study was approved by the ethical committee of Golestan University of Medical Sciences (GOUMS).

RESULTS

Among 278 eligible CRC cases, 227 patients (81.7%) could be accessed and were enrolled in this study. The median of participants' age was 54 years with interquartile range of 44–66 years. Of participants 138 (60.79%) were male. The stage of tumour was identified in 209 cases (92.1%), of which, 42 (20.1%), 105 (50.2%) and 62 (29.7%) were localised, regional and distant metastasis respectively. HUI could be assessed in 218 subjects (96%). Of these, 128 subjects (58.7%) had good HU and 90 cases (41.3%) had poor HU. Table 1 shows the relationship between HU and different variables. The results of multivariate analysis suggested a significant relationship between HU and subjects'

Table 1. Relationship between subjects' socio-demographic factors and stage of tumour with healthcare utilisation (HU) in colorectal cancer patients from Golestan province, Iran

Variables	Total number*	Number (%) of subjects with poor HU	Crude OR (95% CI)	*P*	Adjusted OR (95% CI)	*P*
Gender						
Male	133	46 (34.59)	–	–	–	
Female	85	44 (51.76)	2.03 (1.16–3.54)	0.01	1.85 (0.95–3.61)	0.07
Age groups						
<54	105	43 (40.95)	–	–	–	–
≥54	113	47 (41.59)	1.03 (0.60–1.76)	0.92	1.03 (0.50–2.13)	0.93
Education						
Educated	118	34 (28.81)	–	–	–	–
Illiterate	84	40 (47.62)	2.25 (1.25–4.03)	<0.01	1.79 (0.85–3.77)	0.13
Place of residence						
Urban	104	36 (34.61)	–	–	–	–
Rural	111	52 (46.85)	1.67 (0.96–2.88)	0.07	2.65 (1.30–5.40)	<0.01
Complementary insurance coverage						
No	148	53 (35.81)	–	–	–	–
Yes	53	20 (37.73)	1.09 (0.57–2.08)	0.80	1.60 (0.75–3.42)	0.22
Stage of tumour						
Localised	42	17 (40.48)	–	–	–	–
Regional	101	32 (31.68)	0.68 (0.32–1.44)	0.31	0.44 (0.19–1.02)	0.06
Distant	59	34 (57.63)	2 (0.89–4.47)	0.09	1.25 (0.50–3.11)	0.63

OR, odd ratio; CI, confidence interval.
*Missing data were excluded.

Table 2. Colorectal cancer-specific survival rates according to socio-demographic factors and stage of tumour in Golestan province, Iran

Variables	1-year survival (%)	3-year survival (%)	5-year survival (%)	Median survival (month)	*P*-value*
Healthcare utilisation					
Good	76	66	57	71.10	<0.01
Poor	60	30	25	15.73	
Stage of tumour					
Localised	100	92	80	Not reached	<0.01
Regional	93	62	51	63.27	
Distant	10	02	02	4.77	
Gender					
Male	73	52	48	44.23	0.36
Female	69	50	38	38.63	
Age groups					
<54	69	49	40	34.67	0.61
≥54	73	53	49	51.97	
Education					
Educated	72	58	50	63.27	0.46
Illiterate	77	53	45	46.97	
Place of residence					
Urban	74	57	50	61.40	0.14
Rural	69	47	39	34.50	
Complementary insurance coverage					
Yes	83	67	63	Not reached	0.02
No	71	52	44	42.8	

*Log rank test.

place of residences. The proportion of subjects with poor HU was significantly higher in participants from rural areas. We found no significant relationship between HU and other variables.

The median (95% CI) time of subjects' survival was 40.5 (24.83–56.17) months. The 1-, 3- and 5-year survival rates were 71%, 52% and 44% respectively. Table 2 shows the 1-, 3- and 5-year survival rates among different groups of variables. In univariate analysis, there were significant relationships between subjects' survival with stage of tumour (Table 2, Fig. 1), HU (Table 2, Fig. 2), and complementary insurance coverage (Table 2).

The results of Cox regression analysis showed that stage of tumour, HU and place of residents were the

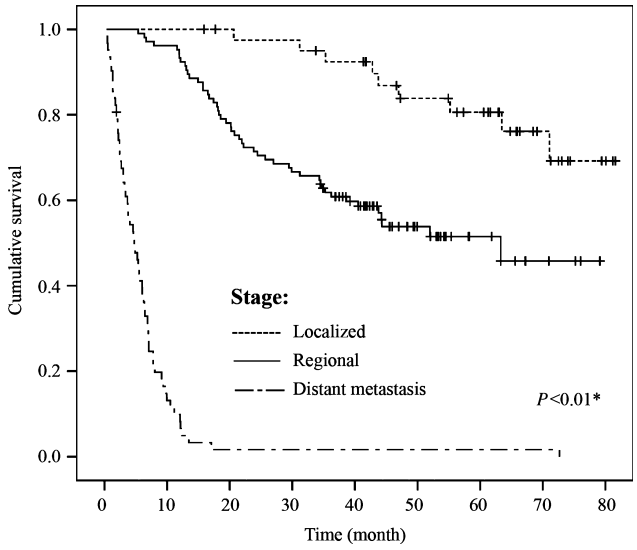

Figure 1. Colorectal cancer-specific survival in Golestan, Iran according to stage of cancer. *Log rank test.

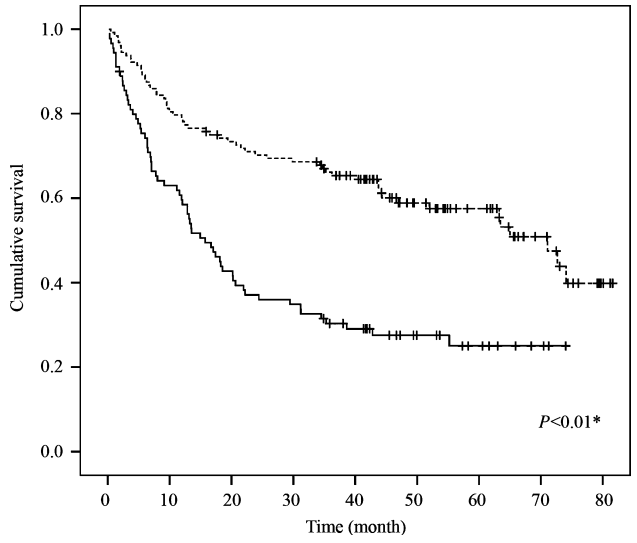

Figure 2. Colorectal cancer-specific survival in Golestan, Iran according to healthcare utilisation status. Solid line indicates poor healthcare utilisation and dash line indicates good healthcare utilisation. *Log rank test.

strongest variables related to survival in CRC patients (Table 3).

DISCUSSION

Healthcare utilisation is an important indicator of outcome in many conditions. The increasing trend in incidence of CRC suggested it as an important heath problem in the developed world as well as the developing countries. We aimed to assess major determinants of HU and its effect on patients' survival in Northern Iran.

Our results suggested that patients' place of residence was the strongest variable related to their access to healthcare services. The proportion of subjects with poor HU was significantly higher in residents of rural areas than those from urban areas. Geographic disparities in access to healthcare services were reported in different groups of patients. Cooper *et al.* (1999) reported differences in the use of follow-up procedures in CRC patients across geographic regions. The results of a study from Mexico showed significant inverse relationship between travel distance and receipt of radiotherapy in patients with breast cancer (Athas *et al.* 2000). Geographical distance to health services providers is an important determinant of patients' utilisation of healthcare services. So, geographical distribution of patients should be considered as a major criterion for allocating healthcare resources. This may help to ensure effective and ethical allocation of resources in health systems, especially in low-resources settings.

We found higher proportions of poor HU if female subjects, illiterate subjects and subjects with distant metastasis, although none of these relationships were significant. Previous studies also reported relationships between HU and patients' socio-demographic characteristics (Viljoen *et al.* 2013). Polite *et al.* (2006) reported differences in the receipt of appropriate therapy between African Americans and White CRC patients. Other studies suggested racial and ethnic disparities in HU among CRC and other cancer patients (Shavers & Brown 2002; Berry *et al.* 2009; White *et al.* 2010). Heath insurance and tumour characteristics coverage were also reported as a determinant of access to healthcare services in CRC patients (Roetzheim *et al.* 2000; White *et al.* 2010).

Healthcare utilisation may be affected by different factors including patient-related (e.g. socio-demographic) as well as tumour-related factors (e.g. stage of tumour). Identifying major determinants of HU in each region may be helpful in designing appropriate interventions to ensure ethical distribution of healthcare services and consequently may result in implementation of effective controlling programmes.

Subject's refusal to get healthcare may be considered as a possible reason for poor HU in some cases. This may just occur due to lack of knowledge or negative attitude towards efficacy of a healthcare service. Such condition should be differentiated from a situation in which a patient does not have access to a healthcare service. As a limitation of the present study, we could not assess this point in our subjects. So, it is recommended to consider and control this variable in future studies.

Our findings showed a significant relationship between HU and survival rate in CRC patients. We found signifi-

Table 3. Cox regression analysis of factors predicting survival in colorectal cancer patients from Golestan province, Iran

	Univariate analysis			Multivariate analysis		
Variables	Crude hazard ratio	95% CI	*P*-value	Adjusted hazard ratio	95% CI	*P*-value
Healthcare utilisation						
Good	–	–	<0.01	–	–	<0.01
Poor	2.46	1.71–3.54		2.30	1.46–3.64	
Stage of tumour						
Localised	–	–	<0.01	–	–	<0.01
Regional	2.96	1.45–6.07		4.27	1.98–9.21	
Distant	46.45	21.94–93.34		72.33	30.36–172.34	
Gender						
Male	–	–	0.36	–	–	0.89
Female	1.18	0.83–1.68		1.03	0.66–1.60	
Age groups						
≥54	–	–	0.61	–	–	0.05
<54	1.09	0.77–1.55		1.55	1.00–2.39	
Education						
Educated	–	–	0.46	–	–	
Illiterate	1.15	0.79–1.68		0.97	0.61–1.54	0.90
Place of residence						
Urban	–	–	0.14	–	–	
Rural	1.30	0.91–1.85		1.66	1.02–2.70	0.04
Complementary insurance coverage						
Yes	–	–	0.02	–	–	
No	1.83	1.11–3.00		1.54	0.89–2.67	0.12

CI, confidence interval.

cant lower survival rates in subjects with poor HU. The relationship between HU and subjects' survival rate remained statistically significant even after adjusting for other variables including the stage on tumour, place of residence, gender, age, education and complementary insurance coverage (Table 3). So, our results suggested an independent association between HU and survival. The results of a study from the USA showed a lower CRC mortality in Medicare beneficiaries with higher utilisation of primary care (Ferrante *et al.* 2013). Yim *et al.* (2012) have also reported an independent effect of HU on survival rates in patients with CRC and stomach cancer. Access to medical care was suggested as an important determinant of survival (Chaisson *et al.* 1995; Acurcio Fde *et al.* 1998). HU, as a predictor of patient outcome, should be taken into account in CRC controlling programmes, especially in high-risk areas. Fair access to healthcare services among CRC patients may ensure better outcome and may result in reducing the burden of this disease in the community.

Stages of tumour, patients' place of residence as well as age were related to survival rates in our CRC subjects. Biological characteristics of tumour, including stage, were known as important predictors of survival in cancer patients. A number of patient's socio-demographic factors including race (Chien *et al.* 2005; Alexander *et al.* 2007), education (Aarts *et al.* 2013), insurance coverage (Roetzheim *et al.* 2000), socioeconomic status (Fitzgerald *et al.* 2014) and age (Lee *et al.* 2013) were also suggested as determinants of outcome in CRC and other cancer patients. There were discrepancies in the strength of association between these factors and patients' survival rates among different populations. Determination of major predictors of survival may play a pivotal role in designing appropriate interventions for reducing the burden of cancers, especially in low-resources settings. Therefore, further large-scale studies are warranted to identify all possible predictors of CRC survival in our region as well as other high-risk populations.

In conclusion, our results suggested HU as an independent predictor of survival in CRC patients. We also found a significant relationship between patients' place of residence and HU in these patients. Regarding its importance on patients' outcome, HU and its determinants should be considered in designing CRC controlling programmes in our population and other high-risk areas.

CONFLICT OF INTEREST

None.

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